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U.S. ARMY ROLE IN SPACE

BY

LIEUTENANT COLONEL JOSEPH R. NOWLAND

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U.S. ARMY ROLE IN SPACE

AN INDIVIDUAL STUDY PROJECT

BY

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ABSTRACT

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THE ARMY'S ROLE IN SPACE

CHAPTER I

Introduction

The U.S. Army has a rich heritage in space, most notably the Army Ballistic Missile Agency, which developed the Jupiter rocket that launched our Nation's first satellite, Explorer 1, into space on 31 January 1958. This historic beginning was quickly followed by a string of successes by the Army that included the launching of Explorer 3 and 4, the development of the first communications satellite, the first lunar and solar probes and the launching of monkey's Able and Baker into space aboard an Army Jupiter nosecone, the first living beings recovered alive from near-earth space flight. Even America's first two men in space were launched into space aboard an Army Mercury-Redstone missile.1 These events marked the begining of our Nation's exploration of space, a journey that would not have been possible without the contributions of the Army.

Thereafter, the Army developed a war fighting doctrine that has placed a significant dependence on space based systems for command and control, reconnaissance, surveillance, meteorology, navigation and attack warning. However, the role that the Army should play in this new medium has yet to fully evolve.

This paper will feature an review of unclassified literature concerning the Army's role in space. Through the reference material in books, professional journals and government

documents, this paper will suggest several roles that the Army should play in space as it moves into the 21st century and attempts to meet the demands of the AirLand Battle 2004 Doctrine.

A necessary starting point for this study project is a brief discussion of current military space systems and a historical review of the Army's past role in space.

CHAPTER II

Military Role in Space

> I do not say that we should or will go unprotected against the hostile misuse of space anymore than we go unprotected against the hostile use of land or sea, but I do say that space can be explored and mastered without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe.
>
> President John F. Kennedy
> Rice University, Texas
> 12 September 1962

The first use of space for military operations can be traced to October 4, 1957, when the Soviet Union orbited "Sputnik", the world's first man-made satellite.2 Since then, over 2000 military payloads have been launched into space by the United States and the Soviet Union to exploit the strategic and operational value of space for military purposes. This "militarization" of space has led to the development of military space systems of enormous value in the areas of communications, surveillance and reconnaissance, navigation, attack warning and meteorology which has greatly enhanced the combat effectiveness of military forces.

What we have seen is an evolution in space from a medium for exploration, research and development to a new theater for military operations, commonly referred to as the "new high frontier" or "fourth dimension" that provides a tremendous potential for military application. This rapid development of modern weapons and the subsequent changes in our war-fighting

doctrine has gradually increased our reliance on space-based systems to a point where space is the only medium in which some important military functions can be effectively conducted.3 This reliance on military satellites can best be illustrated by a brief description of the capabilities that satellities provide.

Communications

The credibility of any military force depends on its ability to fight enemies in a variety of environments, whose capabilities vary, across the full spectrum of conflict. To that end, an effective fighthing force must possess a highly efficient communications system. The US currently operates five space-based communications systems to enhance the dynamics of its combat power: the Defense Satellite Communications System (DSCS); Fleet Satellite Communications (FLTSATCOM) System; Satellite Data System (SDS); Leased Satellite (LEASAT) System; and the Air Force Satellite Communications (AFSATCOM) System. (Although not a part of this paper, it should be noted that commercial satellite systems provide significant capabilities that can be utilized by the military.)

The Defense Satellite Communications System is a super high-frequency (SHF) satellite system "designed to provide worldwide secure voice and high data rate communications for command and control, crisis management, and intelligence data transfer. The DSCS supports tactical communications through the Ground Mobile Forces Satellite Communications (GMFSC) Program.

The space segment consists of a mixture of five Phase II and three Phase III satellites in geostationary orbit with four of the eight satellites acting as on-orbit spares....The DSCS supports the DOD by providing high-capacity transcontinental communications, service between the NCA/JCS and the US CINCs and their component forces, and from early warning sites to operations centers....Additionally, the DSCS supports DCS service to remote locations not adequately served by other means, and provides jam-resistant secure communications, EAM dissemination, and ECCM networks to selected users".4 The DSCS serves as the primary means for Army's long-distance communications requirements.

The Air Force Satellite Communications (AFSATCOM) System "provides for Emergency Action Message (EAM) dissemination, JCS/CINC internetting, force direction, and force report back. Communications are also provided for a limited number of high-priority non-Single Integrated Operation Plan-capable force elements. The space segment consists of AFSATCOM transponders (communication packages) carried on various host satellites (Fleet Satellite Communications System and Leased Satellite System). Coverage is worldwide except for the south polar region."5 This UHF system provides the Army's Special Operating Forces with secure voice or secure teletype communications.

The Fleet Satellite Communications (FLTSATCOM) System provides "worldwide DOD tactical communications to the Navy, Air Force and other DOD agencies. FLTSATCOM provides UHF/SHF

communications between command centers and fleet elements with naval surface, submarine and airborne forces, communications during contingency operations, and special requirements. FLTSATCOM also acts as a host system for AFSATCOM....FLTSATCOM has five deployed spacecraft in geostationary orbit providing worldwide coverage of the earth's surface between 70 degrees N and 70 degrees S latitude".6 The dedication of the twenty-three RF channels to high-priority users restricts the Army from using this system except during extreme situations.

The Leased Satellite (LEASAT) Communications System "consists of four geosynchronous satellites which provide worldwide communications for DOD. LEASAT is being fabricated as an adjunct to the FLTSATCOM system and will be used primarily by the US Navy for interconnecting ships, submarines, aircraft and shore stations. In addition, AFSATCOM transponders (communication packages) carried on LEASAT, provide communications for some non-nuclear Air Force units....The LEASAT system provides a much needed communications capability for command, control, and communications (C3) operations worldwide; however, it is essentially a peacetime system (e.g., no anti-jam and nuclear-hardened capabilities)."7 A limited number of these UHF channels are made available to Army users.

The Satellite Data System (SDS) consist of three satellites that operate in a highly elliptical polar orbit to provide communications coverage to areas that are out of line-of-site of the Defense Support Program (DSP) satellite system. These

satellites travel around the world twice each day, with half of its orbit time over North America and half of its orbit time over the Soviet Union. The SDS System is the only US military communications satellite that does not operate in a geosynchronous orbit.8

MILSTAR (Military Strategic and Tactical Relay) Communications System is the next generation of communications satellite which will serve strategic and tactical forces with a worldwide, jam-resistant, survivable satellite communications system into the next century. Capable of operating in the UHF, SHF and EHF frequency ranges, MILSTAR provides the minimum essential command and control requirements of the National Command Authority (NCA).9 Principle users of MILSTAR will be the strategic nuclear-capable forces, the Navy, and tactical mobile forces of the Army, the Marine Corps, and the AirForce. The Army will use the Single Channel Objective Tactical Terminal (SCOTT) to interface with the MILSTAR network.

Surveillance and Reconnaissance

Surveillance satellites perform a wide range of purposes and are normally divided into three basic categories: photographic, electronic and ocean reconnaissance.

Photographic reconnaissance satellites are normally used for strategic intelligence gathering missions such as accessing the posture of potential adversaries in peacetime or monitoring compliance of arms agreements. Tactical uses have also been

developed as the resolution of the camera improves and the availability of the data has increased.10

Electronic reconnaissance satellites, also referred to as electronic intelligence (ELINT) satellites, are designed to detect and monitor radio electronic signals generated by enemy activities. This information can be used to identify the size, deployment and readiness of enemy forces as well as identify the location of air defense and early warning radars for targeting and electronic countermeasures. Electronic reconnaissance can also play a significant support role in the verification aspect of arms control agreements.11

Ocean reconnaissance satellities locate and track surface vessels on the high seas. Orbiting 600 miles high, these satellites detect electronic emissions from ocean-going ships through radio and microwave receivers. Computer comparisons of the communications and radar signals emitted by these vessels over time, provide the location and direction of the ships being observed. These satellites will also play an important role in future anti-submarine operations.12

Navigation

To know one's exact position on land, at sea and in the air, has long been a requirement of military forces. While technical advances have been made with terrestrial navigational systems, these type systems are limited by range and regional coverage. For example, the ground-based LORAN (Long Range Aid to

Navigation System provides some navigational aid to ships, but reaches out to only roughly 600 nautical miles during daylight hours.13

The United States deployed its first satellite navigational system (Transit) in 1964 to provide precise position updates for the Polaris Submarine Fleet. Released to civilian use in the late 1960's, the Transit System provided every user equipped with an appropriate receiver with navigational accuracy of 50 meters. Although positions could be fixed on land and at sea, the Transit System could not fix aircraft or missiles in flight.14

The replacement system - US Navigational Satellite Timing and Ranging Global Positioning System (NAVSTARGPS or GPS) - will provide worldwide position accuracy to 10 meters. Providing position accuracy to within 10 meters, navigation and timing 24 hours a day, under all weather conditions, GPS will offer substantial improvements to a wide variety of air, sea and land military operations. For the Army, GPS will provide timely and precise positioning of friendly and enemy forces, more effective fire support and close air support, enhance special operating forces, and serve as a significant force multiplier to our combat forces.15

The Global Positioning System, besides performing its navigational and timing functions, will also provide a nuclear explosion detection capability. Small nuclear detonation detection (NDS) devices will be installed on the GPS satellites

that will be able to detect nuclear detonations around the world.16

Meteorology

The Defense Meteorological Satellite Program (DMSP) consist of two satellites in synchronous polar orbit that provides weather information to military forces four times daily. In war, this system may be the only source of meteorological data that is available to military commanders. Army forces can obtain DMSP support through the Air Force Staff Weather Officer (SWO) or Air Force Weather Service Detachments at airfields.17

Geodesy

Geodetic satellites provide information on the size, shape and gravitational fields of the earth. This permits more precise mapping of the earth's surface necessary for the inertial guidance systems of our ICBM's and cruise missile systems. Defense Mapping Agency (DMA) also uses this information to produce traditional military maps.18

Attack Warning

Perhaps the most critical and important tasks that satellites perform is early warning of an enemy ballistic missile attack. These satellites, in geosynchronous equatorial orbit, track missiles by observing the infrared radiation emited by the rocket. Although the current family of early warning satellites can only predict a relative point of impact (footprint) for

incoming missiles, they still provide sufficient warning to launch US ICBMs and disperse our strategic bomber force. These satellites may provide as much as twenty-five minutes warning times, while the warning times may be considerably less for submarine launched missiles depending on their location.19

In virtually every form of military operation, from low-intensity conflicts to strategic war, satellites serve as a major "force multiplier". They gather scientic and technical intelligence, monitor arms control agreements and international crises, observe troop movements, and locate high-value targets. They show how navy's are deployed, provide warning of missile attack, and intercept communications signals which carry the enemy's order of battle. Satellites provide accurate and timely forecast for planing and execution of strategic and tactical operations. They provide timing, position and navigation aid to land, sea and air operations and make it possible to guide "dumb" munitions with perfect precision. Then there are the communications satellites which carry eights-tenths of all military voice and data transmissions.20

Today, the United States relies heavily on the capabilities of military satellites. They not only play a crucial role in the maintenance of peace, but are vital to the planning and prosecution of war. This dependence on satellites has been progressively reinforced as the variety and capabilities of equivalent terrestrial systems has diminished.21

CHAPTER III

Army's Use of Space

In the early days of space exploration, the Army was the preeminent leader in space research and development. Its role can be traced to Robert H. Goddard's work in rocket technology in the early 1900's. Although Goodard's work first found favor in Germany where scientists and engineers adapted his research to develope the V1/V2 rockets, Goodard's efforts began the Army's activities in space. At the end of World War II, the Army became formally involved with space activities with the surrender of Dr. Wernher von Braun to the Seventh Army in 1945. Wernher von Braun and German rocket scientists and technicians formed the nucleus of the Army team to build the first US rocket in 1953.22

Wernher von Braun led the Army's development of the nation's first anti-ballistic missile in 1956, and the launching of America's first satellite in 1958 aboard an Army four-stage Juno rocket. Other Army efforts included the development of the Jupiter-C Intermediate Range Ballistic Missle (IRBM), the world's first active communications satellite and several of the first moon probes and geodetic satellites. "Even America's first two men in space, Commander Alan B. Sheppard Jr., US Navy, and Captain Virgil I. Grissom, US Air Force, were launched into space in 1961 aboard an Army Mercury-Redstone missile in 1961."23

The Army Map Service and its successor, the Army Topographic Command, were also deeply involved in military space operations

by developing maps of the moon that were used by American astronaunts during the Apollo program. The Army Corps of Engineers also played an important role in the Army's early days in space, by building much of the launch, test, and research facilities that NASA utilized to conduct many of its earlier flights.24

In spite of the Army's successes, President Dwight D. Eisenhower initiated the National Aeronautics and Space Act of 1958 and directed that the National Aeronautics and Space Administration (NASA) and the Air Force lead our future efforts into space. Thus, the Army's role in space was reduced to that of a customer of space capabilities. The irony was that the Army's involvment in space operations had been reduced while this new medium was growing in importance to the Army.25

The Army has recently made several commitments to reestablish its role in military space operations. It established an Army Space Policy26 in 1985 to fully exploit evolving space technologies. It developed a Space Master Plan (ASMP)27 in April 1987 to provide strategy, guidance and taskings to develop and institutionalize the Army's exploitation of space to support the execution of the Army's AirLand Battle Doctrine. In April 1988, the Army activated its own component, US Army Space Command (USASC), to the US Space Command which was formed in September 1985. These and other similar activites have demonstrated the Army's efforts to resume an active role in military space operations.

CHAPTER IV

AirLand Battle Doctrine and Space

"Mastery of space is an important prerequisite for achieving victory in war"
Dictionary of Basic Military Terms
USSR, 1965

The future battlefield has been characterized as nonlinear, chaotic, intense and highly destructive, complicated by the possible use of chemical, biological and nuclear weapons.28 To fight and win in this environment, the Army has developed the AirLand Battle Doctrine, which relies heavily on the fundamental tenets of initiative, agility, depth and synchronization. "Initiative means setting or changing the terms of battle by action."29 It implies an offensive spirit in the conduct of all operations. Agility calls for friendly forces to act faster than the enemy and to concentrate forces at the point of the enemy's greatest vulnerabilities. It is the principle means through which a smaller force defeats a numerically superior force. "Depth is the extension of the battle in space, time and resources. Commanders use depth to obtain the necessary space to maneuver effectively; the necessary time to plan, arrange and execute operations; and the necessary men and equipment to win the battle."30 Synchronization is the means by which these efforts are tied together to establish conditions for the decisive application of combat power.31

This style of war "encompasses agility, deception, firepower and maneuver to present enemy forces with a succession of dangerous and unexpected situations more rapidly than ne can react to them."32 Commander's must be able to identify high-value enemy targets, seize the initiative, and use synchronization of effort to fight outmanned and outgunned. The extension of tne close battle will create an even greater demand on the synchronization of maneuver and fires. Corps and division commanders will need real-time surveillance and reconnassiance over their area of interest to concentrate reserves and fires against isolated enemy formations. Violent engagements lasting only minutes and hours will require the timely transmission of orders to reposition forces before the arrival of enemy follow-on forces. Topographic products will be necessary to provide commanders with timely information on the terrain over which their future operations will occur. Air maneuver and long-range artillery units will require real-time reconnaissane of friendly and enemy locations to determine when and where their munitions can generate the highest return. A survivable, responsive and jam resistant communications system will be necessary to tie these requirements together.33

The volatility of the modern battlefield and the requirements for the synchronization of the rear, close and deep battle will also necessitate surveillance, reconnaissance and target acquisition systems capable of rapid collection, fushion and simultaneous dissemination of vital information throughout the battlefield. Mobility is an absolute essential. The network

must be flexible enough for the reorientation or expansion of the corps area of operations and be capable of continuous operations under enemy attack. Current terrestrial systems alone do not offer the sufficiency of connectivity among key operating elements, interconnectivity among forces and availability of resources to satisfy these requirements.34 These systems also suffer from lack of capacity, electronic jamming, frequency detection, range and coverage limitations.

Space-based systems cannot totally replace terrestrial and airborne system but offer enhanced capabilities that provide timely, reliable information in a ready-to-use form, to support the decision cycle and the communications to facilitate the execution of orders. Satellites can observe troop movements and locate high-value targets. They can for the first time permit ground forces the use of a navigational tool comparable to those found in aircraft and on ships. Weather and environmental data can be collected, analyzed and transmitted directly to command posts on the battlefield. Critical environmental data can be portrayed graphically on a video terminal for review. All of the essential ingredients for bringing combat power to bear can be provided from over-head platforms. Space-based systems also do not require allocation of critical strategic lift assets to transport equipment or base support to the theater of operation.35

New US airborne battlefield surveillance systems (JSTARS, ASARS-2, ATARS and JSIPS) being developed by the Army and Air

Force will offer tactical commanders additional day/night, all-weather capability to "see" deep behind enemy lines in a conventional war, but do not provide the same capabilites and survivability as space-based surveillance systems because of stand-off positioning limitations and air platform flight-time restrictions. These systems are also vulnerable to air and conventional missile attack.36

Commitment to the AirLand Battle Fighting Doctrine has signaled the expansion of the battlefield into space. Every form of military operation, across the entire spectrum of conflict, will be supported by space systems. This commitment also signals a greater dependence on space-based systems and the need for the Army to take a greater role in space.37

CHAPTER V

Army Space Roles and Missions

"Space is just another place where wars will be fought"
Senator Barry M. Goldwater

The Army's ability to accomplish the missions specified in JCS Pub 2 is becoming increasing dependent on the integration of space-based systems into the AirLand Battle Doctrine. Although the Army's Space Master Plan (ASMP) has yet to be finalized (AMSP has been out for review for six months), several roles become apparent that the Army must undertake to insure that the necessary military satellite support is available to the Army to fight the land battle as it moves into the 21st Century.

Space Control. Space control operations provide for the freedom of action in space for friendly space-based systems while denying freedom of action to potential adversaries.39 To maintain this environment, the Army must acquire an anti-satellite capability to ensure that those space systems supporting ground actions remain operational. On balance, the US benefits more from the use of space-based systems than does the Soviet Union. Alternative terrestrial and airborne systems provide a degree of redundancy, however, these systems are not capable of providing the same degree of real-time collection, fusion and dissemination of data necessary to fight the "deep-attack" doctrine. Space-based radar and infrared imaging systems are also being developed that will penetrate cloud cover and to allow nighttime

surveillance. Terrestrial and airborne systems do not have the same capability. Survivability programs for our satellite systems provide some protection, but these efforts can not overcome the long-term effects of an unrestricted Soviet anti-satellite capability.

The Soviet Union possesses the world's only operational anti-satellite system, a ground-based orbital interceptor, and although it has been described as a "crude" weapons system by some,40 it has been tested against satellite targets on at least twenty occasions since October 1968. These tests have clearly demonstrated a capability to attack satellites in low orbit (up to 5,000 kilometers or 3,100 miles).41 This is critical to military ground operations as "vitually all vital US intelligence gathering satellites orbit well within the range of the Soviet ASAT."42 Just as the Army would attempt to destroy Soviet terrestrial and airborne reconnaissance systems, the Army needs a reliable means at the operational and tactical level to attack Soviet communications, reconnaissance and targeting satellites that can direct forces and fire power against our conventional ground forces and anti-satellite weapons which can destroy our critical strategic over-head assets.

The U.S. does not currently have an anti-satellite capability. The US had developed and tested an air-launched missile (Air-Launched Miniature Vehicle-ALMA) with a heat-seeking warhead that could be fired from an F-15 aircraft at high altitude and intercept Soviet satellites in low orbit. However,

after conducting several tests, the Congress banned further testing in 1987. The Defense Acquistion Board has recently approved the Army to lead a multi-service effort to develop an anti-satellite capability.43 "The objective of the ASAT program is to deploy either a land-based or sea-based ASAT kinetic energy program based on SDI (Strategic Defense Initiative) technology."44 Kinetic energy weapons destroy targets by either impact or timed explosion.

Space Support. These operations provide essential support to ensure that space systems that support ground, air and sea forces are sustained and maintained. They include such activities as launching, maintaining, sustaining and recovering space vehicles and satellites in space. It also includes the management of launch facilities, ground control centers, astronaunt training, satellite repair, replacement and reconstitution, and space traffic control.45 The Army can play a role in many of these areas, and in fact it is already involved in several, nowever, to significantly impact on the support that space systems provide, the Army must develop its own satellite constellation to support its unique operational and tactical needs. Although current US space-based systems offer considerable capability, the demands that will be placed on these strategic systems during major conflicts make their availability questionable for operational and tactical use. A surrogate system of single-purpose satellites (LIGHTSAT or CHEAPSAT - although no satellite is cheap), geographically focused and under the control of the U.S. Space Command, as a supporting CINC to the warfighting CINC's, would

provide greater flexibility, availability, reliability and security for inter-theater tactical intelligence and communications as well as reduce the burden on the JCS satellite control network. Additional spare LIGHTSAT's should also be launched into space and remain doormat until needed, while other spares remain on earth prepared for immmediate launch to replace destroyed assets or to increase space-based system capabilities to meet increased requirements.

The Army must also develop a capability to inexpensively launch satellites. The heavy dependence on the Space Shuttle to launch military payloads became evident after the Challenger accident which prevented the orbiting of military satellites for nearly two years. The Army cannot afford to have such a limitation during high tensions or conflict. The Soviets have clearly recognized the importance of this capability and have developed and tested an impressive "surge" launch ability. This is partially due to the short life-span of their satellites and the frequency that they must replace their space assets. It does however, present a significant ability to replace or expand their satellite systems. The US does not have a similar capability. This limitation could encourage the Soviets to strike our over-head assests knowing that even if the US had the ability to strike back and did so, the Soviets could replace all of their satellites in short order.

Force Enhancement. This is the use of space systems in the conduct of combat operations to improve the effectiveness of

terrestrial forces. To effect this enhancement, the Army must acquire and operate space-based systems for navigation, meteorology, tactical warning and attack assessment, nuclear detection and communications to support its Airland Battle Doctrine. In the near term, the Army must procure satellite terminals and ground control stations to leverage the available technology of our existing satellite constellation. As an example, USAREUR purchased a meteorological satellite receiver capable of receiving weather data directly at the operational level from two types of weather satellites (Geostationary Operational Environment Satellite [GOES] and European METROSAT).46 In the mid-term, the Army must purchase additional satellite terminals and ground stations with advanced state-of-the-art technology that can improve the collection, fusion and dissemination of data that is already available from our existing systems.

In the long term, the Army must reestablish its preeminent role in the development, design and operation of new satellite systems, satellites, terminals and ground control stations, to insure that Army unique needs are satisified. The past practice of acting as a customer of space systems capabilities and adjusting doctrine and military operations to the capabilities of the available systems, has proven to be ineffective and inefficient.

Manned-Space Operations. The Army must develop a capability to put trained personnel into space to conduct military

functions. The ability of a human to see, interpret, understand and integrate data is superior in many ways to that of a computer assisted remote sensor. This is particularly true when a problem or situation needs to be analyzed and decisions need to be made quickly and decisively. A military crew member in space can respond to rapidly changing requirements as they occur on the ground by redirecting over-head sensors, data collectors and communications systems to focus on new situations or to support a new mission. This flexibility cannot be measured, but it also cannot be overlooked. As an example, during two US manned-space missions to the moon, equipment failure caused life theatening situations to develop forcing the crew to override the computer systems, analyze the problem and take corrective action. In both cases, because the crew was able to find a solution to the problem, both crew and aircraft returned safely. There is some question how these situations would have ended had the automated systems been forced to complete the mission.

Recent US manned-space missions (US has only recently returned to space since the Challenger accident) have focused primarily on medical experiments, earth observations, material and compound research and launching of commerical and military satellites. Although these programs do not appear to contribute directly to a military function (except for the miliary satellite launches), they set the foundation for future experiments and research that will benefit the war fighting effort. Manned-space missions that could directly enhance the Army's deep attack doctrine include: determining the disposition of enemy ground

forces and their intentions; provide tactical C3I to support theater operations; provide target acquistion data to operational and tactical fire direction systems and assist operational commanders by "seeing deep" and more comprehensively assessing threat stengths and weaknesses. "A dramatic illustration of this important aspect of manned space activity occured when astronaunts on board the Skylab noticed unexpected eddy current phenomena in the sea currents below. Their findings are important both for the military application of minimization of submarine observables and for the interpretation of sonar returns."47 Having a military observer in space also eliminates the prejudice that many of our ground combat leaders have towards "computers and technology", and increase the confidence level of the information being provided.

The Soviets have recognized the importance of a manned-space capability and have made a strong commitment to use their manned space program to achieve "military superiority" in space. Of interest in their most recent flights, have been the repeated experiments in remote sensing, oceanography, meteorology and geodesy. The Soviets have also concentrated on the production of materials with apparent military application. Their success in the rendezvous with space platforms is indeed impressive and clearly an important part of any military manned-space program. With the launch of their new space stations (MIR-Peace in Russian) in 1986, the Soviets have had a nearly continuous manned presence in space.48

Conclusion

The US Army needs a balanced military space program consisting of manned and unmanned space systems and platforms, multi-purpose and single purpose satellites oriented to Army unique missions and geographic areas, launch facilities and recovery capabilities, an anti-satellite capability and a vigorous research and development program to leverage current and future space technologies that will enhance the Army's war fighting abilities. Given the dependency that the Army now places on this new medium, it is critically important that the US Army take full advantage of the capabilities that space has to offer. In that regard the Army must exercise an active role in the articulation of space requirements, monitoring of space system development, funding of space programs and most importantly, the operational control and conduct of space systems in direct support of land combat missions.

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